Should We Teach Every Soldier How to Start Intravenous Fluids?

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The recent mandate by the US Army Training and Doctrine Command requiring all Soldiers entering Basic Combat Training after October 1, 2007, to be combat lifesaver (CLS) certified is an outstanding step to improve training across the Army in lifesaving first-aid skills.[1] However, the requirement for all Soldiers to be competent in placing an intravenous (IV) line and initiating treatment with IV fluids, per the current CLS standards, may not be the best use of precious training resources in the light of the most recent medical research and battlefield experience.

The outcome of a battle casualty will often be determined by whoever provides initial care. In most cases this will be a fellow Soldier, not a medic. The CLS course was developed to bridge the gap between self-aid or buddy-aid until care could provided by the platoon combat medic (military occupational specialty 68W).[2] The CLS concept has been further refined over the last decade to reflect the concepts of Tactical Combat Casualty Care (TC3), which focuses on treating the leading causes of preventable battlefield death while minimizing the risk to first-aid providers and the tactical mission.[3] The TC3 concept is possibly the most significant advance in point of injury care since the distribution of the individual field dressing in the late 1800s.[4]

The most important battlefield first-aid skill is controlling hemorrhage, by far the leading and most preventable cause of battlefield death in modern warfare. Bellamy showed 9% of those killed in action during the Vietnam conflict died of potentially preventable extremity hemorrhage.[5] A similar fatality rate from compressible extremity hemorrhage in Iraq was demonstrated by Cuadrado et al.[6] Proper tourniquet application is the most important method in the control of severe hemorrhage in the tactical setting.

Other lifesaving skills emphasized in the TC3 include needle decompression of a tension pneumothorax and airway management, the second and third leading causes of preventable battle field deaths, causing 4% and 1% of all fatal injuries respectively.[5-10]

The main purpose of performing IV catheterization in the setting of trauma is to administer fluids or blood products to treat hemorrhagic shock. Seven percent of patients on the battlefield require aggressive resuscitation.[11] Current transfusion protocols emphasize fresh whole blood and procoagulants rather than crystalloids to restore organ perfusion, prevent the dilution of clotting factors, and avoid hypothermia.[11] For patients in significant hemorrhagic shock, aggressive hemorrhage control at the point of wounding, followed by expeditious transport to surgical care, is most important. Evacuation and subsequent surgical management of noncompressible truncal hemorrhage should not be delayed by attempts to place an IV.

In the management of shock, the traditional strategy of early fluid resuscitation beginning in the field and continuing into the operating room has been challenged, specifically in the context of penetrating thoracic trauma. In 1994, a prospective trial by Bickell et al[12] compared immediate versus delayed fluid resuscitation in hypotensive patients with penetrating torso injuries. They reported that patients in whom fluids were restricted until arrival in the operating room had lower mortality, fewer postoperative complications, and shorter hospital length of stay. In a follow-up prospective trial, patients were divided into either restrictive resuscitation (goal systolic blood pressure (SBP) greater than 80 mm Hg) versus liberal resuscitation (goal SBP greater than 100 mm Hg). There was not a significant difference in mortality between groups, but hemorrhage did take longer to control in the group with the liberal fluid strategy.[13]

These studies were largely responsible for significant changes in the management of injured Soldiers on the battlefield and were adopted by US military and Israeli Defense Forces.[14-18] In 2003, Holcomb[14] introduced the term "hypotensive resuscitation" in his article about lessons learned in Somalia. Current military prehospital doctrine now emphasizes the restriction of IV fluids in casualties who have controlled hemorrhage, normal mental status, and stable vital

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signs or even mild hypotension (systolic blood pressure greater than 90). A relatively small percentage of all combat casualties are likely to benefit from IV fluid resuscitation on the battlefield. These include patients with significant hypotension resulting from severe hemorrhage that has been controlled; and those with hypotension or severe hemorrhage and a head injury. All other casualties with uncontrolled hemorrhage and signs of shock may be challenged with a very limited amount of IV fluid (1000 mL of Hextend). Further fluid administration is likely to be detrimental. The practice of permissive hypotension is designed to prevent "popping the clot" off an injured vessel, as well as the dilution of clotting factors with massive amounts of crystalloid fluid.

IV placement is a skill that requires significant time to train. In the current CLS course, the IV portion is the longest, most resource and instructor intensive block of training. This is precious training time that could be used for tactical casualty scenarios and practicing sustainable, life-saving skills, such as hemorrhage control techniques. In the civilian sector, Basic Emergency Medical Technicians (EMT-B) are not taught IV insertion. The first level of civilian EMT to have IV placement in their scope of practice is EMT-Intermediates. The national standard curriculum for EMT-I requires 300 to 400 hours of classroom and field instruction after EMT-B certification. EMT-I students are required to place a minimum of 25 IVs on live patients of various age groups under instructor supervision to be considered competent in this skill.[19] The current AMEDD *CLS Course Instructor Guide*[20] does not specify the number of successful IV catheterizations required to certify a CLS in this skill. It is left to the unit's medical officer. Certification as a CLS will not mean that these Soldiers are competent at placing IVs. At best, it will mean they are familiar with the procedure.

Casualties presenting in overt shock typically have difficult intravenous access. They are often extremely diaphoretic and their peripheral vasculature is constricted. Placement of an IV in a trauma patient in a moving ambulance by an experienced EMT-I or higher level provider takes 10 to 12 minutes and has a 10% to 40% failure rate.[21] Paradoxically, starting an IV in those patients who would most benefit from limited fluid resuscitation will be extremely difficult for even the most skilled medical provider. During a hostile tactical situation combined with darkness, fatigue, and fear, it will be very unlikely that a Soldier without significant medical experience will be able to place an IV under battlefield conditions. For this reason, TC3 guidelines emphasize sternal intraosseous catheter placement for fluid resuscitation.[22]

Insertion of an IV catheter is not without risks. Complications include local and systemic infections, thrombophlebitis, catheter embolism, and injury to associated nerves, tendons, and arteries.[23-25] Complications are inversely related to the skill and experience of the medical provider.

Based on the available literature and the lessons being learned from both Iraq and Afghanistan, it is clear that IV placement is not a critical life-saving skill, while hemorrhage control is. Training all Soldiers to start IVs without the requisite understanding of the indications, contraindications, risks, and benefits of who would benefit from IV fluids and who could be harmed could result in many receiving unneeded or detrimental care on the battlefield. If Soldiers spend the vast majority of their first-aid training time learning IV placement, the most time-consuming skill in the CLS course, yet one that does not save lives, which tool will they reach for under the stress of combat? Will Soldiers be killed by snipers as they waste precious minutes starting IVs? Will evacuation be delayed while attempts to "get the IV" are made? Will proper tourniquet and dressing application be neglected while focusing on the more "technical" and "high-speed" IV insertion?

While most Soldiers will not benefit from IV training, it may have a place in some units. Units operating far forward with little or no organic medical support, such as Special Operations Forces, may benefit from this training. These units are often small and have the time and resources to train to a high standard in advanced first-aid skills.

Many line commanders likely participated in "IV training" led by their unit medical officers during their formative years. Insertion of an IV on the "first stick" is considered by many as the quintessential battlefield medical skill. It is not. Rapid hemorrhage control is. Additional medical training for all Soldiers is much needed. The Training and Doctrine Command has taken an excellent first step. Our battlefield commanders want robust first-aid training for our Warriors. We must continue to synthesize the tactical and medical lessons from the present conflicts to guide our training. It is the duty of the Army Medical

Department and military health care providers to develop best practices of battlefield care and advise our combat commanders how to implement them. Together we can save lives on the battlefield and accomplish the Army mission.

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